BriskHeat®
Corporation

Centipede 2® STACK™

Temperature Control System

User Interface Instructions

Instruction Manual

⚠	Read and understand this material before operating or servicing these heating tapes. Failure to understand how to safely operate these heaters could result in an accident causing serious injury or death. These heaters should only be operated by qualified personnel.

Table of Contents

LUI/ RS-232 Setup **4**
Hardware Requirements 4
RS-232 Communication Set-up 4
Telnet over Ethernet Setup **5**
Setting Up IP Address through a Windows XP-based PC 5
Setting Up Hyper Terminal Through a Windows XP-based PC 6
Log-In Instructions **8**
User Interface Command List **8**
Detect and Assign Control Zone IDs **9**
Enumerate Control Zone IDs 9
Detect and View Control Zones 9
Reset Zone IDs and Settings 9
Reload 9
Manually Set and Individual Zone ID 10
Manually Set Multiple Zone IDs 10
Program Temperature Control Zones 11
Read / View Status of Temperature Control Zones 12
Dump Command (Data Logging) 12
Setting Alarm Relay - Latching Alarm Feature **13**
Alarm Relay Summary Table 13
Understanding the Message Status Codes **14**
Normal Conditions Status Codes 14
Autotune Mode Enabled Status Codes 14
Locate Module / Zone ID Mode Enabled Status Codes 15
Operator Interface Set-up **16**
Time and Date Set-up 16
Password Change 17
Communication Mode Set-up 17
Modbus RTU Protocol Set-up 17
TCP / IP Set-up 18
Display Operator Interface Settings and Firmware Version 18
Locate Zone ID (Orange LED) **19**
Operator Interface Reset **20**
Log Out Instructions (Exit Session) **20**
Appendix A: Centipede 2® Operator Interface Register Definitions **21**
Appendix B: Centipede 2® Control Zone Register Definitions **22**
Appendix C: Alarm Relay Setup **24**
Appendix D: Controller Configuration Commands **29**
Appendix E: Understanding the Message Status Codes **30**
Hexidecimal to Binary Conversion Chart **30**
Trouble Shooting: Status Register Definitions **31**
Contact Information **32**

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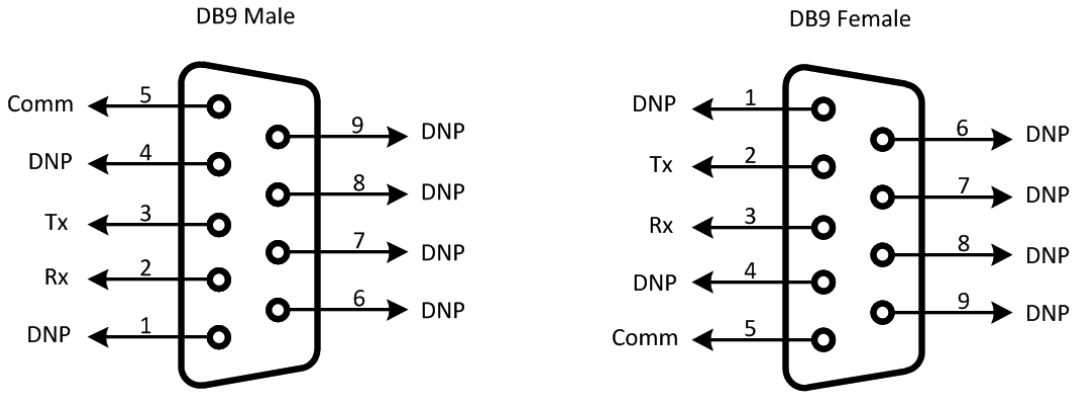
LUI / RS-232 Setup

Hardware Requirements

Customer supplied communication cable is required to utilize the LUI over RS-232C communications mode.

The Centipede 2® requires this straight-through communication cable to use the Male DB9 connector to mate to the Female DB9 installed in the C2STACK-OI.

Please terminate the properly sized wire gauge as shown in the below drawing. Follow the connector manufacturer's instructions for proper termination and solder techniques.



DNP = Do Not Populate

Tx = Transmit

Rx = Receive

Comm = Common Ground

⚠ WARNING

Do not insert any pins or wires into DNP locations. Incorrect pinning and wiring could result in damage to the Centipede 2® Temperature Control System or the ancillary equipment attached to the Centipede 2®

C2STACK-OI.

RS-232 Communication Set-up

Ancillary Equipment Communication Parameters
- Slave mode running on an RS-232 physical layer
- Baudrate: 19.2k
- 8 bits, 1 stop bit, and no parity

Verify the COM MODE 1 LED is illuminated on the C2STACK-OI

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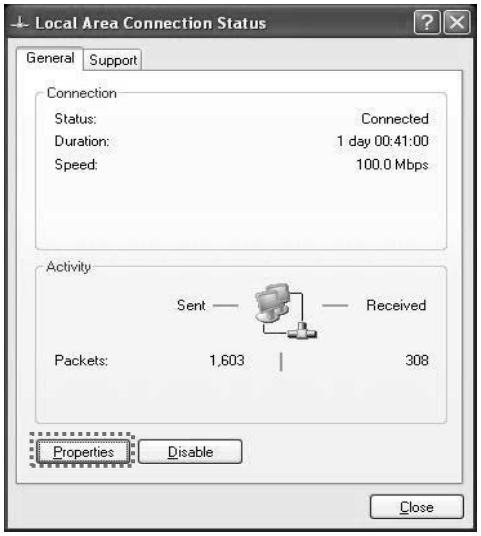
TelNet Over Ethernet Setup

Setting Up IP Address Through a Windows XP-based PC

Step 1: Locate Local Area Connection Properties

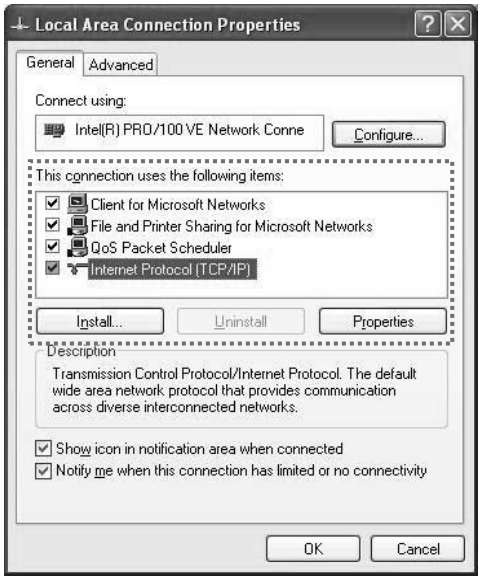
- Start button > Control Panel > Network Connections > Local Area Connection **Or** Double click on LAN icon at bottom right of screen

- Click **Properties** button



Step 2: Locate Internet Protocol (TCP / IP) Properties

- Select Internet Protocol (TCP/IP)
- Click **Properties** button



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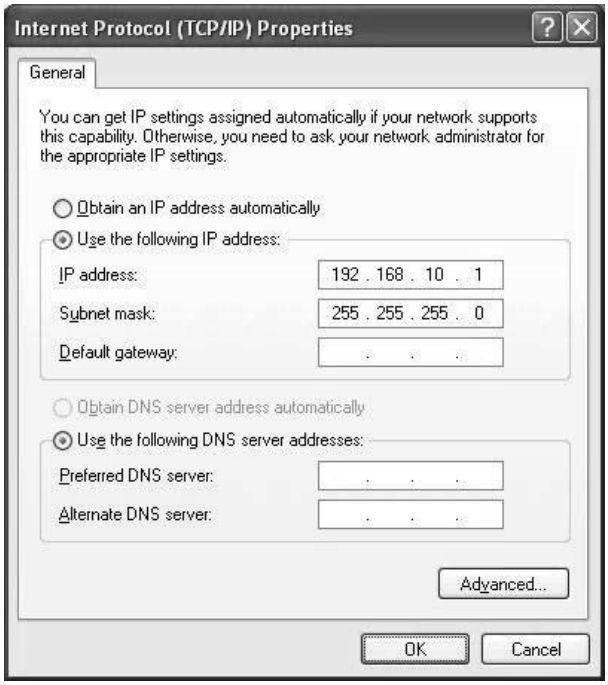
Step 3: Input Internet Protocol (TCP/IP) Parameters

Record existing IP address settings if you require previous network access

1. Select 'Use the following IP address':
   IP address: **192.168.10.1**
   Subnet mask: **255.255.255.0**
2. Click **OK** button


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 10 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Setting Up HyperTerminal Through a Windows XP-based PC

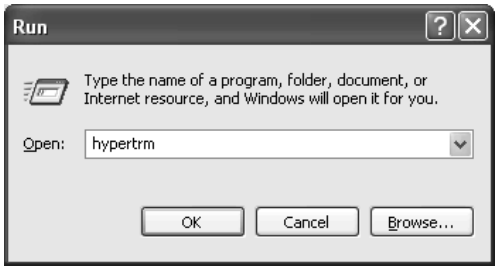
Set up your HyperTerminal location before setting up the HyperTerminal for your system.

Step 1: Load HyperTerminal

- Start button > All programs > Accessories > Communications > Hyper Terminal

Or

- Start button > Run … > type **hypertrm** > Click **OK** button


Run
Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.
Open: hypertrm
OK
Cancel
Browse...

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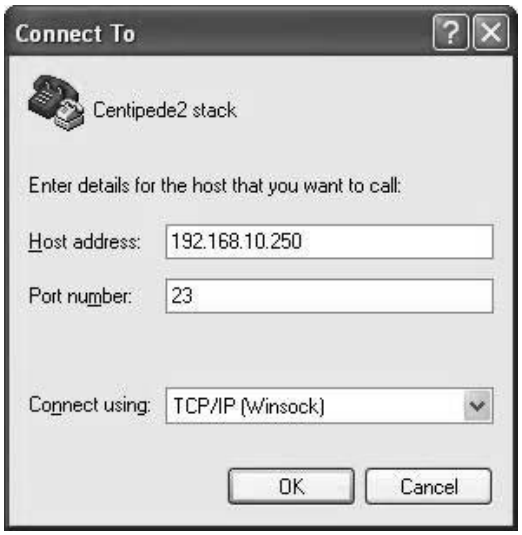
Step 2: Input Connection Description

- Input a Connection Name: Example: "BriskHeat® Centipede 2® Temperature Control"
- Select Icon
- Click **OK** button

Step 3: Input the following 'Connect To' parameters

- Host address: **192.168.10.250**
- Port number : **23**
- Connect using: **TCP / IP (Winsock)**
- Click **OK** button



Step 4: Set-up Hyperterminal Properties

To make characters visible when using HyperTerminal follow steps:

a) Press File
b) Properties
c) Settings Tab
d) Click ASCII Setup
e) Check the box called "Echo Typed Characters Locally"
Do not change any other parameters in this screen

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Log-in Instructions for User Interface

Screenshot
Welcome to Brisk Heat's OEM OI setup
Version 1.8.xxx
Please enter password:

1. Type in Login password: **briskheat** (default password)
2. Press [Enter]
3. Retype Login password
4. Press [Enter]
5. List of commands display

Operating Instructions:

Type a Command and press [Enter] to initiate a command.

See Appendix A and B for a list of Register Definitions. Appendix A has a list of register definitions stored on the operator interface. Appendix B has a list of register definitions stored on each temperature control zone.

User Interface Command List

'?' Command

Displays list of commands. Type *?* and then press [Enter].

Screenshot

Bye	Ends this telnet session
Reset	Resets the program
Reload	Reloads system to default parameters
Show	Shows connection settings
Sm	Shows Enumerated Modules
En	Enumerate Modules (Query Locked Module/Zone ID(s))
IdReset	Resets All Module/Zone ID values to 1-n
IdSet:	Sets Module/Zone ID values nn:ID (nn=phys position (1-n))
IdSetR:	Sets Module/Zone ID values nn:ID:qty (nn=phys position (1-n))
lmon:	Locate Module/Zone ID and blink corresponding LED lmon:ID
lmoff	Discontinue Module/Zone ID locate
Unlatch	One-shot unlatching of all latched heater alarms
LUIOn	Enable RS-232 Local User Interface
LUIOff	Disable RS-232 Local User Interface
ModAddr:	Modbus Address ModAddr:Address (address = 1-255)
Dnsaddress1:	Sets the first dns address to use on network
Dnsaddress2:	Sets the backup dns address to use on network
Password:	Sets the case sensitive password
Ipaddress:	Sets ip address to use when connecting to server
Settime:	Sets local time hh:mm:ss mm/dd/yyyy format
Gateway:	Sets gateway address to use to get to internet
Netmask:	Sets up the tcpip netmask
Timezone:	0 for utc, offset for local time
Rr:	Reads register RR:register number
Wr:	Write register WR:register,value,additional params
Dump:	Dumps data to screen, optional param is time in seconds

* Modbus RTU mode is off when Local User Interface mode is on: Com Mode 1
** Modbus RTU mode is on when Local User Interface mode is off: Com Mode 2

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Detect and Assign Control Zone IDs

Enumerate Control Zone IDs

'En' Command

Type *En* and then press [Enter].

Detects all installed zones. Any control zone without a Zone ID will be auto-assigned a Zone ID based on its physical location. E.g. Zones 1,2,3,4,5,….

After performing the 'En' function, perform the 'Sm' command to confirm that the required zones are detected. See *Detect and View Control Zones.*

Screenshot:
BH> en
Enumerating Modules

Detect and View Control Zones

'Sm' Command

Type *Sm* and then press [Enter].

Displays all zones with a Zone ID. Verify that the required numbers of zones are detected for your installation.

If there are multiple zones with the same Zone ID or there are missing zones, perform an IDRESET. See *Reset Zone IDs and Settings*.

Screenshot:
BH> sm
Enumerated modules
1, 2, 3

Reset Zone IDs and Settings

'Idreset' Command

Type *Idreset* and then press [Enter].

Resets and auto-assigns all Zone IDs. This function should be performed when there are multiple zones with the same Zone ID (e.g. 1, 1, 2, 2, 3, 3) or when you wish to reset all temperature zone register values.

This function resets all temperature zone register values (set-point, high-limit, etc.) back to its default parameters. See Appendix B for a list of all default module register values.

Screenshot:

BH> sm
Enumerated modules
1, 1, 2
BH> idreset
Resetting Module/Zone ID(s)

BH> sm
Enumerated modules
1, 2, 3

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Manually Set an Individual Zone ID

'Idset' Command

Type *Idset:X:Y* and then press [Enter].

X = Physical Zone Location
Y = Desired Zone ID #

Set a specific Zone ID number to a single zone.

In the screenshot example below, the user changes the Zone ID of the first zone to 55.

Screenshot:
BH> idset:1:55
Setting Module/Zone ID

BH> sm
Enumerated modules
55, 2, 3

Manually Set Multiple Zone IDs

'Idsetr' Command

Type *Idsetr:X:Y:Z* and then press [Enter].

X = Physical Zone Location of the First Zone to Change
Y = Desired Zone ID # of First Zone to Change
Z = Number of Zones to Change

Set multiple zone IDs in sequence at one time.

In the screenshot example below, the user changes the Zone ID of the fourth physical zone to 10. The user also requires three zone IDs to be assigned starting with the fourth physical zone. The three zones are re-assigned to the desired sequence: 10, 11, 12.

Screenshot:
BH> idsetr:4:10:3
Setting Module/Zone ID
BH> sm
Enumerated modules
1, 2, 3, 10, 11, 12

Reload Default Parameters

'Reload' Command

Type *Reload* and then press [Enter].

Screenshot:
BH> reload
Reloading default parameters

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Program Temperature Control Zones

1. Select the Temperature Zone that you would like to program
   A. Option 1: Program All Temperature Zones:
      Command: **wr:3,0**
   B. Option 2: Program an Individual Zone
      Command: **wr:3,X** (X= zone number)
2. Select the Temperature Zone Setting that you would like to program

	Setting	Command	Example
1	Set-Point Temperature	wr:4,5,X00 (X= temperature in °C)	wr:4,5,15000 Programs set-point to 150.00°C
2	High-Limit Temperature	wr:4,6,X00 (X= temperature in °C)	wr:4,6,17000 Programs high-limit to 170.00°C
3	Low-Limit Temperature	wr:4,7,X00 (X= temperature in °C)	wr:4,7,13000 Programs low-limit to 130.00°C
4	Disable / Enable Zone	Disable: wr:4,2,0 Enable: wr:4,2,32768	Default setting: Enabled
5	PID Auto tune	wr:4,2,40960	

See Appendix B for a complete list of Control Zone Register Definitions.

Screenshot of Global Programming

BH> wr:3,0 ß Focus on all zones. Press [Enter]

BH> wr:4,5,15000 ß Set-Point 150°C. Press [Enter]

BH> wr:4,6,17000 ß High-Temperature Limit 170°C. Press [Enter]

BH> wr:4,7,13000 ß Low-Temperature Limit 130°C. Press [Enter]

Screenshot of Individual Zone, Example: Zone 2

BH> wr:3,2 ß Focus on individual zone. Press [Enter]

BH> wr:4,5,14000 ß Set-Point 140°C. Press [Enter]

BH> wr:4,6,18000 ß High-Temperature Limit 180°C. Press [Enter]

BH> wr:4,7,12000 ß Low-Temperature Limit 120°C. Press [Enter]

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Read / View Status of Temperature Control Zones

1. Select the Temperature Zone that you would like to view
   A. Command: **wr:3,X** (X= zone number)
2. Select the Temperature Zone Setting that you would like to view

	Setting	Command
1	Set-Point Temperature	rr:4,5
2	High-Limit Temperature	rr:4,6
3	Low-Limit Temperature	rr:4,7
4	Zone Status	rr:4,2
5	Duty Cycle	rr:4,12

See Appendix B for a complete list of Control Zone Register Definitions.

Screenshot Example: Viewing Set-Point of Zone 1
BH> wr:3,1 ß Focus on zone 1. Press [Enter]

BH> rr:4,5 ß View Set-Point (register 5). Press [Enter]

150

Dump Command (Data Logging)

Type dump [Enter]

Screenshot of Dump Command (Data Logging)
BH> dump

Data log every 10 seconds

ADDRESS 1 STATUS 8001 TEMP 150.01 C DUTY 40
ADDRESS 2 STATUS 8001 TEMP 150.01 C DUTY 40
ADDRESS 3 STATUS 8001 TEMP 150.02 C DUTY 41
ADDRESS 1 STATUS 8001 TEMP 150.03 C DUTY 39
ADDRESS 2 STATUS 8001 TEMP 150.02 C DUTY 39
ADDRESS 3 STATUS 8001 TEMP 150.01 C DUTY 40

To Exit Dump (Data Logging): Press [Enter] key

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Setting Alarm Relay - Latching Alarm Feature

The Centipede 2® has a built in alarm relay with latching alarm feature that is user configurable for your application. Each condition to which latching applies (See Alarm Operation Summary Table) will be individually enabled. The term latching means that when a condition's actuation criteria are met, the alarm, all of its control actions, and outward indicators will remain in their actuated state until the condition is unlatched by user intervention (i.e. If a high temp alarm condition occurs, the individual zone will remain in the non-heating mode until a user unlatches the zone). The alarm unlatch setting can be accessed on the text user interface which will momentarily unlatch all latched alarms. The unlatch function will unlatch all zones simultaneously. Any zones that are considered to be in alarm mode will re-latch.
Refer to Appendix C to determine the code for your alarm needs.

Alarm Relay Summary Table

*Low heater and High heater are warnings that only are reflected in the dump query report

Condition	Control Action	Latch Configuration				Low Temp Timer Configuration		Alarm Relay	LED
		Type	Scope	Storage	Default	Scope	Default		
High Temp	disable heat	user	Global	Non-volatile	enabled	n/a		Yes	Yes
Low Temp	none	user	Global	Non-volatile	disabled	Global	30 min	Yes	Yes
Open RTD	disable heat	user	Global	Non-volatile	disabled	n/a		Yes	Yes
Short RTD	disable heat	user	Global	Non-volatile	disabled	n/a		Yes	Yes
Open Heater	disable heat	user	Global	Non-volatile	enabled	n/a		Yes	Yes
Short Heater	disable heat	user	Global	Non-volatile	enabled	n/a		Yes	Yes
Low Heater	None	None	n/a	n/a	n/a	n/a		No_1	No
High Heater	None	None	n/a	n/a	n/a	n/a		No_1	No

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Understanding the Message Status Codes

Normal Conditions Status Codes

The following are common codes that will be displayed when a zone is enabled

Zone configuration
Heater: **On**
Autotune: **Off**
Locate Module/Zone: **Off**
Resistance Check: **Off**

Common Codes

Displayed Status Value	Status Message	Description
8001	STATUS_OK	Current temperature is within alarm limits
8002	STATUS_HIGH	Current temperature is above high alarm limit
8004	STATUS_LOW	Current temperature is below the low alarm limit
8008	STATUS_RTD_SHORT	RTD is shorted
8010	STATUS_RTD_OPEN	RTD is open
8020	STATUS_HEATER_OPEN	Heater is open, or resistance is above limit
8040	STATUS_HEATER_SHORTED	Heater is shorted, or resistance is below limit
8080	STATUS_TRIAC_DRIVER_BAD	Triac driver is not responding
8100 / 8101	STATUS_NETWORK_COMMS_BAD	Communications channel is bad
8200 / 8201	STATUS_HEATER_CONFIG_COMM_BAD	Communication failed during heater configuration
8400 / 8401	STATUS_LINE_CTRL_COMM_BAD	Communication error with heater line module
4	STATUS_HEATER_DISABLED	Zone is disabled

See Appendix C for a complete list of status codes.

Autotune Mode Enabled Status Codes

The following are common codes that will be displayed when Autotune is turned on

Zone configuration
Heater: **On**
Autotune: **On**
Locate Module/Zone: **Off**
Resistance Check: **Off**

Common Codes

Displayed Status Value	Status Message	Description
a001	STATUS_OK	Current temperature is within alarm limits; Autotune is on
a002	STATUS_HIGH	Current temperature is above high alarm limit; Autotune is on
a004	STATUS_LOW	Current temperature is below the low alarm limit; Autotune is on
a008	STATUS_RTD_SHORT	RTD is shorted; Autotune is on
a010	STATUS_RTD_OPEN	RTD is open; Autotune is on
a020	STATUS_HEATER_OPEN	Heater is open, or resistance is above limit; Autotune is on
a040	STATUS_HEATER_SHORTED	Heater is shorted, or resistance is below limit; Autotune is on

See Appendic C for a complete list of status codes

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Locate Module/Zone ID Mode Enabled Status Codes

The following are common codes that will be displayed when module locator is turned on

Zone configuration
Heater: **On**
Autotune: **Off**
Locate Module/Zone: **On**
Resistance Check: **Off**

Common Codes

Displayed Status Value	Status Message	Description
9001	STATUS_OK	Current temperature is within alarm limits; Zone Locator is on
9002	STATUS_HIGH	Current temperature is above high alarm limit; Zone Locator is on
9004	STATUS_LOW	Current temperature is below the low alarm limit; Zone Locator is on
9008	STATUS_RTD_SHORT	RTD is shorted; Zone Locator is on
9010	STATUS_RTD_OPEN	RTD is open; Zone Locator is on
9020	STATUS_HEATER_OPEN	Heater is open, or resistance is above limit; Zone Locator is on
9040	STATUS_HEATER_SHORTED	Heater is shorted, or resistance is below limit; Zone Locator is on

See Appendix C for a complete list of status codes

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Operator Interface Set-up

Time and Date Set-up

'Settime' Command

Type *settime:hh:mm:ss mm/dd/yyyy* and then press [Enter].

Sets the local time and date in the following format hh:mm:ss mm/dd/yyyy (e.g. 08:10:00 07/20/2011)

'Timezone' Command

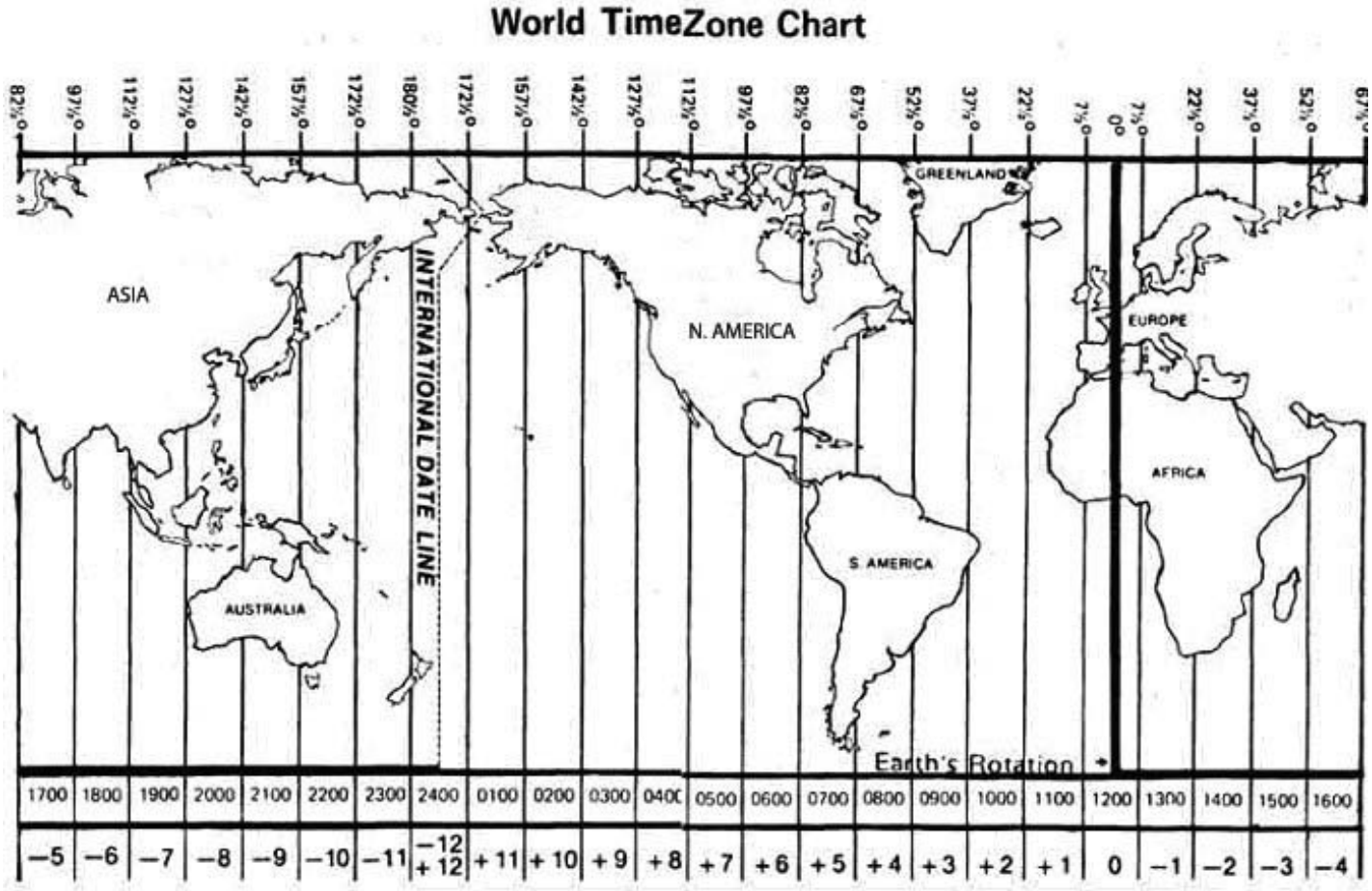
Type *Timezone:XX* and then press [Enter].

XX = UCT offset (E.g. –9 is Japan Time Zone)

*S*ets the UCT / GMT time zone for the location of the system. 0 for UCT (default). Input your local time zone by using Figure 9.1 below.

⚠ *Time and Date parameters are reset if power loss or reset command is initiated.*

Figure 9.1



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Password Change

'Password' Command

Type *password: XXXXXX* and then press [Enter].

Allows the user to enter a new password for access to the local user interface.

Default password: **briskheat**

Communication Mode Set-up

The default communication mode is Com Mode 1: LUIon

'LUIOn' Command

Type *LUIOn* and then press [Enter].

Turns on the LUI Communication functionality. This can be confirmed by the Com 1 mode light illuminated.

'LUIOff' Command

Type *LUIOff* and then press [Enter].

Turns off the LUI Communication functionality. This can be confirmed by the Com 2 mode light illuminated.

You must connect via Ethernet over Telnet to turn on the LUI interface over to RS-232C.

Modbus RTU Protocol Set-up

The default Modbus address is 0.

'ModAddr' Command

Type *modaddr:XXX* and then press [Enter].

XXX = ModBus Address 0 through 255

Sets the ModBus address for the operator interface when communicating using ModBus RTU protocol.

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TCP/IP Set-up

The default TCP/IP settings are generally appropriate for a single Centipede 2® Operator Interface. If multiple Centipede 2® Operator Interfaces are on the same network, multiple TCP/IP addresses are required.

'Dnsaddress1' Command

Type *Dnsaddress1:xxx.xxx.xx.xxx* and then press [Enter].

Sets the first dns address to use on network.

'Dnsaddress2' Command

Type *Dnsaddress2:xxx.xxx.xx.xxx* and then press [Enter].

Sets the backup dns address to use on network.

'Ipaddress' Command

Type *Ipaddress:xxx.xxx.xx.xxx* and then press [Enter].

Sets the IP address to use when connecting to a server.

'Gateway' Command

Type *Gateway:xxx.xxx.xx.x* and then press [Enter].

Sets gateway address to use to get to Internet.

'Netmask' Command

Type *Netmask:xxx.xxx.xxx.x* and then press [Enter].

Sets up the TCP/IP netmask.

Display Operator Interface Settings and Firmware Version

'Show' Command

Type *Show* and then press [Enter].

Screenshot
BH> show
Version 1.8.xxx
Ip address: 192.168.10.250
Gateway address: 192.168.10.1
Netmask: 255.255.255.0
Dns address1: 192.168.10.104
Dns address2: 64.118.139.51

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Locate Zone ID (Orange LED)

Quickly detect the location of a zone by causing the LED to flash orange. This function does not affect the performance of the zone control. The zone will remain in the flashing position until the user turns it off or selects a different zone.

'Lmon' Command

Type *Lmon:X* and then press [Enter].

X = Zone ID to Locate (e.g. 1 = Zone 1)

Turns on LED of corresponding Zone ID to flash Orange. See Figures 10.1 and 10.2.

Figure 10.1
Image of flashing orange light
on C2STACK-CR

Figure 10.2
Image of flashing orange light
on C2MOD-C

Screenshot:
BH> lmon:1
BH>

'Lmoff' Command

Type *Lmoff:X* and then press [Enter].
X = Zone ID to Locate (e.g. 1 = Zone 1)

Turns off LED of corresponding Zone ID to no longer flash orange.

Screenshot:
BH> lmoff:1
BH>

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Operator Interface Reset

'Reset' Command

Type *Reset* and then press [Enter].

Resets the operator interface. The communications session ends. This is the equivalent as turning the power off to the operator interface and turning it back on.

Screenshot:
Welcome to Brisk Heat's OEM OI setup
Version 1.8.xxx
Please enter password:

Time and Date parameters are reset if power loss or reset command is initiated.

Exit Session

'Bye' Command

Type *bye* and then press [Enter].

Ends the current communications session.

The Centipede 2® continues to operate after exiting the communication session.

Screenshot:
BH>bye

Disconnected

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Appendix A: Centipede 2® Operator Interface Register Definitions

Register Description	Address	Memory	Access	Default	Description
Firmware Revision	0	flash	R	NA	
Controller Status Word	1	Flash	R	NA	
Modbus Comms Error Reg	2	RAM	R/W	0	
Module Focus Address	3	RAM	R/W	0	Jacket Module address
Jacket Command Register	4	RAM	R/W		
Jacket Poll response register	5	RAM	R		
Time1	6	RTC	R/W	Current time	BCD hours, minutes
Time2	7	RTC	R/W	Current time	BCD seconds, month
Time3	8	RTC	R/W	Current time	BCD day, year
Module address	9	EEPROM	R/W	0	Modbus addr
Module (controller) Settings	10	EEPROM	R/W	1	Settings
Low Temperature Timer	11	EEPROM	R/W	1800	Low temp timer (secs)
Reserved	12-100				

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Appendix B: Centipede 2® Control Zone Register Definitions

Register Description	Address	Memory	Access	Default	Description
Firmware Revision	0	flash	R	NA	
Line Processor Revision	1	Flash	R	NA	
Heater Status	2	Ram	R/W	NA	
Sampled Temperature	3	Ram	R	NA	Deg c * 100
Controller Config Register	4	EEPROM	R/W	64	
Temperature Setpoint	5	EEPROM	R/W	0	0.00 C
Temperature Hi Limit alarm	6	EEPROM	R/W	0	0.00 C
Temperature Lo Limit alarm	7	EEPROM	R/W	0	0.00 C
100 Ohm Calibration value hi	8	EEPROM	R	6800	Ohms * 100
100 Ohm Calibration value lo	9	EEPROM	R	6800	Ohms * 100
Reserved	10 - 12	NA	NA	NA	
PID Pg Current value	13	Ram	R	NA	
PID Pd Current value	14	Ram	R	NA	
PID Pi Current value	15	Ram	R	NA	
Current PWM percentage	16	Ram	R	NA	
ADC Raw Data value	17	Ram	R	NA	
Reserved	18 - 100	NA	NA	NA	

Appendix C: Alarm Relay Setup: wr.10,"Value"

VALUE	ENABLED ALARM FEATURES
0	NOTHING ENABLED
1	ALARM RELAY ENABLED
2	LOW TEMP LATCH ENABLED,
3	LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
4	HIGH TEMP LATCH ENABLED,
5	HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
6	HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
7	HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
8	OPEN RTD LATCH ENABLED,
9	OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED
10	OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
11	OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED

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Appendix C: Alarm Relay Setup Continued

VALUE	ENABLED ALARM FEATURES
12	OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
13	OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
14	OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
15	OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
16	SHORT RTD LATCH ENABLED,
17	SHORT RTD LATCH ENABLED, ALARM RELAY ENABLED
18	SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
19	SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
20	SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
21	SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
22	SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
23	SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
24	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED,
25	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED
26	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
27	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
28	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
29	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
30	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
31	SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
32	OPEN HEATER LATCH ENABLED,
33	OPEN HEATER LATCH ENABLED, ALARM RELAY ENABLED
34	OPEN HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED,
35	OPEN HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
36	OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED,
37	OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED

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Appendix C: Alarm Relay Setup Continued

38	OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
39	OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
40	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED,
41	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED
42	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
43	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
44	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
45	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
46	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
47	OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
48	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED,
49	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, ALARM RELAY ENABLED
50	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
51	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
52	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
53	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
54	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
55	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
56	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED,
57	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED
58	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
59	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
60	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
61	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
62	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
63	OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
64	SHORT HEATER LATCH ENABLED,
65	SHORT HEATER LATCH ENABLED, ALARM RELAY ENABLED
66	SHORT HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED

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Appendix C: Alarm Relay Setup Continued

67	SHORT HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
68	SHORT HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED,
69	SHORT HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
70	SHORT HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
71	SHORT HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
72	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED,
73	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED
74	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
75	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
76	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
77	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
78	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
79	SHORT HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
80	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED,
81	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, ALARM RELAY ENABLED
82	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
83	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
84	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
85	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
86	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
87	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
88	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED,
89	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED,
90	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
91	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
92	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
93	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
94	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
95	SHORT HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
96	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED,
97	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, ALARM RELAY ENABLED

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Appendix C: Alarm Relay Setup Continued

98	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED
99	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, LOW TEMP LATCH ENABLED,
100	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED,
101	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
102	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED
103	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
104	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED,
105	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED,
106	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
107	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
108	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED
109	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
110	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
111	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
112	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED,
113	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, ALARM RELAY ENABLED
114	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED
115	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
116	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED
117	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
118	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED,
119	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
120	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED
121	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, ALARM RELAY ENABLED

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Appendix C: Alarm Relay Setup Continued

122	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED,
123	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED
124	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED,
125	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, ALARM RELAY ENABLED
126	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED
127	SHORT HEATER LATCH ENABLED, OPEN HEATER LATCH ENABLED, SHORT RTD LATCH ENABLED, OPEN RTD LATCH ENABLED, HIGH TEMP LATCH ENABLED, LOW TEMP LATCH ENABLED, ALARM RELAY ENABLED

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Appendix D: Controller Configuration Commands: wr:4,4, "Value"

Value	Bits That are Set
1	Auto Tune On Start Enabled, High Only Temperature Alarm Enabled
16	Adaptive Tuning Enabled, High Only Temperature Alarm Enabled
17	Auto Tune On Start Enabled, Adaptive Tuning Enabled, High Only Temperature Alarm Enabled
32	High and Low Temperature Alarm Enabled
33	Auto Tune On Start Enabled
48	Adaptive Tuning Enabled, High and Low Temperature Alarm Enabled
49	Auto Tune On Start Enabled, Adaptive Tuning Enabled, High and Low Temperature Alarm Enabled
64	High Only Temperature Alarm Enabled, Auto Heat on Start up Enabled
65	Auto Tune On Start Enabled, High Only Temperature Alarm Enabled, Auto Heat on Start up Enabled
80	Adaptive Tuning Enabled, High Only Temperature Alarm Enabled, Auto Heat on Start up Enabled
81	Auto Tune On Start Enabled, Adaptive Tuning Enabled, Auto Heat on Start up Enabled
96	High and Low Temperature Alarm Enabled, Auto Heat on Start up Enabled
97	Auto Tune On Start Enabled, Auto Heat on Start up Enabled
112	Adaptive Tuning Enabled, High and Low Temperature Alarm Enabled, Auto Heat on Start up Enabled
113	Auto Tune On Start Enabled, Adaptive Tuning Enabled, High and Low Temperature Alarm Enabled, Auto Heat on Start up Enabled

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Appendix E: Understanding the Message Status Codes (Hexidemical to Binary Conversion)

To understand the displayed Status code, you first need to convert the displayed hexadecimal code into the equivalent binary code.

You can use the conversion charts below to easily convert between hexadecimal and binary.

Hexidecimal to Binary Conversion Chart

Hexidecimal Value	Binary Combination
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111

Hexidecimal Value	Binary Combination
8	1000
9	1001
a	1010
b	1011
c	1100
d	1101
e	1110
f	1111

Status Decoding Example:

Example: Hex Value of 8401 is displayed is Heater Status Register:

Displayed Hex Value	8				4				0				1			
Converted Binary Value	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Bit Position	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Heater is enabled because bit 15 is set. There is a communication error between the network board and line power board for the zone because bit 10 is set; the heater is within the alarm limits because bit 0 is set.

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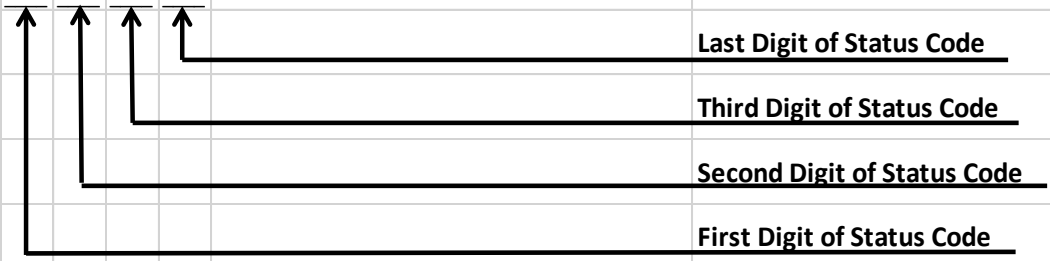
Trouble Shooting: Status Register Definitions

Status Code: ____ ____ ____ ____



Value	First Digit of Status Code	Second Digit of Status Code	Third Digit of Status Code	Last Digit of Status Code
0 or BLANK				
1	BLINK ID	STATUS NETWORK COMMS BAD	STATUS RTD OPEN	STATUS OK
2	ADAPTIVE TUNING ENABLED,	STATUS HEATER CONFIG COMM BAD,	STATUS HEATER OPEN,	STATUS HIGH,
3	ADAPTIVE TUNING ENABLED, BLINK ID	STATUS HEATER CONFIG COMM BAD, STATUS NETWORK COMMS BAD	STATUS HEATER OPEN, STATUS RTD OPEN	STATUS HIGH, STATUS OK
4	START JACKET TEST,	STATUS LINE CTRL COMM BAD,	STATUS HEATER SHORTED,	STATUS LOW,
5	START JACKET TEST, BLINK ID	STATUS LINE CTRL COMM BAD, STATUS NETWORK COMMS BAD	STATUS HEATER SHORTED, STATUS RTD OPEN	STATUS LOW, STATUS OK
6	START JACKET TEST, ADAPTIVE TUNING ENABLED,	STATUS LINE CTRL COMM BAD, STATUS HEATER CONFIG COMM BAD,	STATUS HEATER SHORTED, STATUS HEATER OPEN,	STATUS LOW, STATUS HIGH,
7	START JACKET TEST, ADAPTIVE TUNING ENABLED, BLINK ID	STATUS LINE CTRL COMM BAD, STATUS HEATER CONFIG COMM BAD, STATUS NETWORK COMMS BAD	STATUS HEATER SHORTED, STATUS HEATER OPEN, STATUS RTD OPEN	STATUS LOW, STATUS HIGH, STATUS OK
8	ENABLE HEATER CONTROL,	CALIBRATE RTD CIRCUIT,	STATUS TRIAC DRIVER BAD,	STATUS RTD SHORT,
9	ENABLE HEATER CONTROL, BLINK ID	CALIBRATE RTD CIRCUIT, STATUS NETWORK COMMS BAD	STATUS TRIAC DRIVER BAD, STATUS RTD OPEN	STATUS RTD SHORT, STATUS OK
A	ENABLE HEATER CONTROL, ADAPTIVE TUNING ENABLED,	CALIBRATE RTD CIRCUIT, STATUS HEATER CONFIG COMM BAD,	STATUS TRIAC DRIVER BAD, STATUS HEATER OPEN,	STATUS RTD SHORT, STATUS HIGH,

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Value	First Digit of Status Code	Second Digit of Status Code	Third Digit of Status Code	Last Digit of Status Code
B	ENABLE HEATER CONTROL, ADAPTIVE TUNING ENABLED, BLINK ID	CALIBRATE RTD CIRCUIT, STATUS HEATER CONFIG COMM BAD, STATUS NETWORK COMMS BAD	STATUS TRIAC DRIVER BAD, STATUS HEATER OPEN, STATUS RTD OPEN	STATUS RTD SHORT, STATUS HIGH, STATUS OK
C	ENABLE HEATER CONTROL, START JACKET TEST,	CALIBRATE RTD CIRCUIT, STATUS LINE CTRL COMM BAD,	STATUS TRIAC DRIVER BAD, STATUS HEATER SHORTED,	STATUS RTD SHORT, STATUS LOW,
D	ENABLE HEATER CONTROL, START JACKET TEST, BLINK ID	CALIBRATE RTD CIRCUIT, STATUS LINE CTRL COMM BAD, STATUS NETWORK COMMS BAD	STATUS TRIAC DRIVER BAD, STATUS HEATER SHORTED, STATUS RTD OPEN	STATUS RTD SHORT, STATUS LOW, STATUS OK
E	ENABLE HEATER CONTROL, START JACKET TEST, ADAPTIVE TUNING ENABLED,	CALIBRATE RTD CIRCUIT, STATUS LINE CTRL COMM BAD, STATUS HEATER CONFIG COMM BAD,	STATUS TRIAC DRIVER BAD, STATUS HEATER SHORTED, STATUS HEATER OPEN,	STATUS RTD SHORT, STATUS LOW, STATUS HIGH,
F	ENABLE HEATER CONTROL, START JACKET TEST, ADAPTIVE TUNING ENABLED, BLINK ID	CALIBRATE RTD CIRCUIT, STATUS LINE CTRL COMM BAD, STATUS HEATER CONFIG COMM BAD, STATUS NETWORK COMMS BAD	STATUS TRIAC DRIVER BAD, STATUS HEATER SHORTED, STATUS HEATER OPEN, STATUS RTD OPEN	STATUS RTD SHORT, STATUS LOW, STATUS HIGH, STATUS OK

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